

# **ENERGY COMMISSION SITING CONSTRAINTS OII**

## **TRANSMISSION ISSUE PAPER**

### **INTRODUCTION**

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The purpose of the Siting Committee's workshop (for which this paper was prepared) is to help the Committee develop information about transmission issues that could constrain future generation facility siting decisions in California. The paper identifies two areas where transmission issues could constrain or delay the future licensing decisions. It first discusses the interconnection process, in which the California Independent System Operator (CAISO), the participating transmission owners (PTO's) and the Energy Commission staff identify the effects of interconnecting new generators on the existing transmission system and a range of measures and costs for correcting the problems identified. The second area the paper discusses is the effect of transmission congestion on generation siting decisions. It notes that interconnecting new generation may increase congestion on the grid, but that congestion may also be an impediment to new generation siting.

### **CURRENT PLAYERS AND THEIR ROLES**

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In addition to the Energy Commission and the project applicant there are, at present, three other entities that may be involved in transmission related matters associated with a new generating facility. Currently the CAISO, California Public Utilities Commission (CPUC) and the Participating Transmission Owner (PTO) all play a role in development of the transmission system.

The Investor Owned Utilities (IOUs) in turning over operational control of their transmission assets to the CAISO became PTOs. As such, they continue to retain a significant level of responsibility for the planning, financing and construction of new transmission facilities.

The CAISO has taken on the role of coordinating the planning for the overall grid; independently examining the PTO plans on an integrated statewide basis and preparing a coordinated CAISO-wide plan looking out from one to seven years. The CAISO also has the role of ultimately deciding what transmission projects need to be built and of providing for their construction either by the respective IOU or through some third party arrangements.

To the extent that a PTO becomes financially involved in the development of a new transmission facility, it may be necessary for the CPUC to issue a Certificate of Public Convenience and Necessity (CPCN), authorizing project construction. In many cases, this includes the preparation of an Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA).

# THE INTERCONNECTION PROCESS AND GENERATION SITING ISSUES

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## THE INTERCONNECTION PROCESS

The Energy Commission, as part of its facility siting process, must approve transmission facilities that connect new generation to the grid. Applicants seeking licensing for new generators must submit an interconnection proposal to the Energy Commission as part of their application for certification (AFC) filing. In addition to the Energy Commission, applicants submit a request for interconnection to the connecting PTO and the CAISO.

Designing an interconnection facility involves coordination among a number of parties, including the applicant, the PTO with which the applicant is connecting, the CAISO, and the Energy Commission. Provisions of the CAISO Tariff and the individual PTO's generator interconnection policy and Transmission Owner (TO) agreements govern the interconnection process. Existing CAISO Tariff language is general, primarily providing for CAISO review and approval of modifications to the transmission system. The CAISO is planning to develop more detailed and specific language, but has yet to file their proposal with Federal Energy Regulatory Commission (FERC).

The interconnection process begins when the applicant files an interconnection request with the connecting utility (PTO) and with the CAISO. The CAISO is generally responsible for overseeing the interconnection process; the interconnecting PTO is responsible for conducting studies to determine reliability impacts on the transmission system associated with the project. The PTO initially conducts a System Impact Study (SIS) to assess what, if any, reliability impacts would result from interconnection. This study may take up to 60 days, with CAISO review requiring up to an additional 30 days. Through this study the PTO and CAISO determine if the proposed interconnection conforms with relevant North American Electric Reliability Council (NERC), Western Systems Coordinating Council (WSCC), and local reliability criteria. The CAISO reviews the study results and may request additional studies, if necessary, to fully evaluate significant reliability impacts. To the extent that negative impacts are identified and the applicant decides to continue with the project, the PTO conducts a Detailed Facilities Study (DFS or FS).

The DFS identifies measures, facilities and costs associated with mitigation of negative impacts to the transmission grid. This study may take up to 120 days with CAISO review requiring up to an additional 30 days. As in the case of the SIS, the CAISO may request additional studies, if necessary, to fully evaluate significant reliability impacts. These times are approximate. If the studies must be completed more rapidly to meet other deadlines, the parties generally attempt to adjust scheduling to meet those deadlines. The PTO may require changes to the interconnection plan to ensure conformance with reliability criteria and the costs associated with such change are the responsibility of the applicant.

The PTO and CAISO also coordinate extensively with the Energy Commission during the siting process to ensure that the interconnection facility conforms with Energy Commission requirements. The CAISO and Energy Commission have entered into an

agreement regarding Energy Facilities Site Certification and Compliance Monitoring. The agreement provides for mutual cooperation between the respective staffs. The CAISO staff assists Commission staff in evaluating transmission information filed by the applicant to help determine data adequacy and the Commission staff keeps the CAISO informed as to project changes. The results from the SIS and DFS are provided to the Commission staff for incorporation into the analysis. The CAISO staff also participates in workshops and provides testimony, where appropriate.

## **RESOLVING RELIABILITY IMPACTS ASSOCIATED WITH INTERCONNECTION**

The system studies prepared by the connecting PTOs identify reliability impacts to the transmission grid caused by the interconnection of specific new generators. Many of these impacts can be some distance from the point the new generator connects to the grid. These impacts (commonly referred to as “downstream impacts”) may involve both reliability and congested related issues.

Reliability impacts<sup>1</sup> downstream of the point of interconnection are identified through the SIS; a plan for mitigating those impacts is developed as part of the DFS. Downstream reliability impacts typically are caused when new generators connecting to the transmission system load transmission lines, transformers, circuit breakers and other system components causing violations of accepted reliability criteria<sup>2</sup>. The SIS and DFS determine whether the new project would cause thermal overloads, voltage violations (voltages too high or low), and/or electric system instability (excessive oscillations). The studies may also verify the availability of sufficient reactive power. The reliability evaluation is conducted for all credible “emergency” conditions. Emergency conditions could include the loss of a single or double circuit line, the loss of a transformer or generator, or a combined loss of these facilities. Many criteria violations can be mitigated through operating procedures or remedial action schemes. Some criteria violations may require the construction of new facilities or the upgrade of existing facilities.

The most common criteria violation seen in a SIS is an emergency overload of one line or transformer when a parallel line or transformer is out of service. These overloads are commonly avoided through the implementation of a Remedial Action Scheme (RAS) that backs down the output from the new generator when the line or transformer is out of service. The new generator is usually faced with the choice of incurring the high costs of replacing a transmission line or transformer or agreeing to a remedial action scheme. In some cases, the connection of a new generator will overload transmission lines when all facilities (lines and transformers) are operating. This is an overload under normal rather than contingency conditions. Normal overloads require equipment upgrade, replacement, or generation curtailment. Current PTO policies require that the

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<sup>1</sup> Reliability impacts are defined as reliability criteria violations that can not be mitigated through generation redispatch. Most thermal overloads caused by the connection of new generation can be mitigated through redispatch.

<sup>2</sup> These criteria include, Western Systems Coordinating Council (WSCC) Reliability Criteria, North American Electric Reliability Council (NERC) Planning Standards, Cal-ISO Reliability Criteria.

generator mitigate these overloads by upgrading or replacing transmission lines or transformers.

The costs associated with interconnection studies and mitigation measures vary greatly. PTO studies may cost between \$50,000 and \$100,000, while mitigation of criteria violations can range from very little to hundreds of millions of dollars. For example, circuit breaker replacement is quite common and depending on the number and size of the breakers can cost anywhere from low thousands to \$30 million.

## **ISSUES ASSOCIATED WITH THE INTERCONNECTION PROCESS**

The interconnection process, study assumptions and findings, and related interconnection costs described above, may give rise to a number of issues that could create uncertainties for developers and delay or otherwise affect siting new generation facilities in California. Staff has identified several issues that may cause such problems including study time lines, queuing assumptions, responsibilities, and multiple siting jurisdictions. We are interested in the views of parties concerning these and other interconnection issues that may adversely affect the siting process.

### **Transmission Study Time Line**

The CAISO/PTO interconnection process typically requires up to 90 days for the PTO to perform a System Impact study (SIS) and potentially 6 months to complete the Detailed Facilities Study (DFS) work. A recent proposal to amend the CAISO Tariff calls for all studies to be completed within 90 days. Once the PTO performs the study and furnishes it to the CAISO, the CAISO may either approve the study or return it to the PTO for revision. The CAISO does not issue an approval until the studies are adequate. Delays in the interconnection process may be caused when applicants, the connecting PTOs, or the CAISO fail to complete studies, or to meet other obligations in a timely manner. What changes to the study process would help alleviate these delays?

### **Queuing Assumptions**

System impact and facility studies conducted by PTOs are sensitive to a variety of assumptions. One important factor influencing the outcomes of these studies is the place each applicant has on the PTO's interconnection study list or "in the Queue." When the PTO performs a DFS or SIS it utilizes the list to identify which generation facilities will be assumed to be operational for each applicant at the time of the study. These assumptions regarding what generation will be on line and how it will operate can have significant impacts on study outcomes concerning reliability impacts, mitigation measures, and costs. Applicants not able to maintain their position in the Queue may obtain different study results than they would have if studies were completed under different study assumptions. Do PTO/CAISO queuing procedures create impediments to timely facility siting? Do those procedures cause uncertainty for applicants in the study process?

### **Cost Responsibility**

Identifying responsibilities for resolving reliability problems and the associated mitigation costs may be problematic because of the different responsibilities of applicants and

PTOs. Interconnecting generators are responsible for the costs of mitigating reliability problems caused when they connect to the existing transmission system. PTOs are responsible for correcting reliability problems in their service areas caused by load growth, aging transmission facilities, and changing generation patterns. Disputes between the connecting PTO and applicant sometime occur over the extent and costs of reliability problems caused by the applicant generator or the PTOs. This kind of situation can create uncertainty for developers regarding interconnection costs and may affect AFC timelines in cases where downstream facilities need to be constructed. How does this uncertainty effect project development? What changes could remedy this problem?

### **Remedial Action Scheme (RAS)**

The use of RAS as a relatively inexpensive way of mitigating reliability problems could affect net generation availability under peak load conditions when it is most needed. A number of new generating facilities are considering the use of RAS to avoid costly transmission system upgrades. If RAS is required to mitigate problems arising from the occurrence of a single or double contingency, with a relatively low probability of occurrence, the reduction in generation will likely have little consequence. However, if RAS is employed to reduce line loading during normal peak load periods, resulting reduction in generation could (at least during the next few years) further aggravate the capacity shortage problem at the very time it is most critical. Is it appropriate to use reductions in generation as a RAS under normal peak load conditions?

### **Siting Jurisdiction Problems**

In cases involving downstream reliability impacts that must be corrected by reconductoring or other significant upgrades, the interconnection process could be subject to certifications by both the Energy Commission and the CPUC. Under these conditions, the Energy Commission would be responsible for certifying the generation facility and the "tap line" connecting the new facility to the grid; the CPUC would be responsible for certifying the transmission reconductoring project. This dual certification requirement could delay the siting process and cause uncertainty on the part of developers. An alternative approach might be to have a single agency responsible for certifying both generation and transmission facilities. Does this create delays or other impediments to siting new generation facilities? Would a single regulatory agency, responsible for licensing both generation and transmission, mitigate such impediments?

## **CONGESTION IMPACTS AND GENERATION SITING ISSUES**

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### **CONGESTION IMPACTS AND FACILITY SITING**

Interconnecting new generation facilities may increase levels of congestion on the grid, in addition to causing reliability problems. In general, congestion problems are produced when transmission lines become overloaded under proposed generation schedules and it becomes necessary for system dispatchers to adjust schedules or take other remedial actions to prevent reliability criteria violations.

The addition of new generation resources to the grid may create new or aggravate existing congestion problems with potentially multiple effects. For example, increased congestion in certain areas may adversely affect the ability of older, less efficient, generation to compete with efficient new power plants for access to transmission facilities and to electricity markets. As congestion increases on the transmission system it may also influence where developers will locate new generators, if such congestion would limit their access to electricity markets. On the positive side, it is possible for a new resource connecting to the grid to relieve existing congestion and lower congestion costs for other parties. Typically congestion increases the costs of transmitting electricity on the grid; however, resolving congestion problems also has significant costs.

Short-term solutions to congestion problems can be addressed through the ISO's congestion management process and through transmission rights. The ISO's congestion management market provides a mechanism through which generators may bid against one another to obtain transmission access over congested transmission facilities. Successful bidders are those that place the highest value on transmission capacity through their bids. Firm Transmission Rights (FTRs) provide holders with financial hedges against increasing transmission prices caused by congestion without actually having to acquire physical transmission capacity. Most generators participating in California's wholesale markets make use of FTRs and participate in the ISO's congestion management markets. New generators choosing to locate along congested paths must take the costs of transmission hedges and the ISO's transmission markets into consideration when making decisions where or whether to locate facilities in California.

As transmission lines become increasingly congested because of generation additions, load growth, and other factors, it becomes necessary to identify longer-term solutions to congestion problems such as transmission expansions. Current ISO interconnection rules defer to PTO Tariffs regarding the mitigation of reliability and congestion impacts caused by new generators. The ISO is, however, proposing a new interconnection policy that would require new generators to mitigate reliability problems, but would not require them to mitigate incremental congestion they may cause when they connect to the grid. Under the proposed CAISO Tariff, transmission expansions to remedy congestion problems would be the responsibility of the "market" and, in theory, would be planned and financed by market participants. The assumption underlying this policy is that "market forces" will drive such expansions based on the relative costs of reducing congestion and the benefits associated with accessing profitable markets.

## **CONGESTION RELATED SITING ISSUES**

Congestion between points on the system can have multiple impacts, as we note above. It may limit market access for new generators and influence where they choose to locate. Congested transmission facilities may also limit the ability of in place, less efficient, generation to compete with new generation in obtaining access to the grid. Siting new generation may also reduce congestion levels on the grid under some circumstances. These types of impacts point to a number of issues. We are sure there are other issues and we encourage developers and other market participants to use the workshop as an opportunity to identify and discuss them.

### **Congestion and Siting Decisions**

Congestion on the grid may affect where new generators locate. The ISO is proposing that new generators not be required to mitigate incremental congestion they cause as a condition of connection. It is not clear, however, to what extent existing congestion may affect siting decisions by developers. We know that in the recent past developers sought to have the ISO require new generators to mitigate incremental congestion they caused, and to “grandfather” transmission rights for existing generators. As part of their argument, they claimed that unless such a policy was adopted increasing congestion would be a significant barrier to their siting additional generation in California. The ISO did adopt this policy, but it was eventually rejected by FERC. Resolving this issue is increasingly important since the Energy Commission has approved nine power plants during the last two years, three along a very congested Path 15. There are thirteen additional facilities currently in the permitting process and another nine developers are proposing new facilities.

### **Market Based Expansions**

The ISO relies on market forces to plan and finance transmission expansions in order to provide long-term solutions to serious congestion problems. The assumption underlying this policy is that transmission expansions to relieve congestion will be undertaken by market participants when congestion costs exceed the cost of relieving congestion constraints. This approach to transmission expansion has not been effective in solving congestion problems. This may be the result of a “free rider” problem, a lack of a mechanism to coordinate planning and financing, or simply an incorrect set of market assumptions. It may also be that congestion is not viewed by the industry as a significant barrier to market entry or generation facility siting.

In recognition of the above problems, the ISO has proposed that as part of their Long-Term Grid Planning process, they undertake a yearly analysis of the grid. Part of this analysis would look at the various congested paths in the system and, if justified, propose expansion projects to mitigate congestion or access regional markets.

### **Displacement of Older Generation**

Congestion caused by new generation may displace older facilities or reduce electricity output by limiting their access to transmission capacity. Under normal competitive conditions this could be viewed as a benefit because displacing older generation with more efficient new generation would result in lower marginal electricity costs and less pollution. These, however, are not normal times. California currently needs all of the generating capacity that it can bring on line, consistent with environmental regulations and accepted reliability standards. Displacing older generation with efficient new generation may increase efficiency; but under these conditions may not add to net generation capacity in California. If increasing transmission capacity on constrained facilities is seen as a solution to this problem what entities should be responsible for planning and financing those facilities?

## ISSUES AND QUESTIONS

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### INTERCONNECTION PROBLEMS AND QUESTIONS

Our overview of interconnection issues summarized above suggests a number of problems that could adversely affect the timely siting of new generation facilities. These include cost responsibility for mitigating reliability problems on “downstream” transmission facilities caused by connecting new generators; the length of the ISO-PTO interconnection study process; Queuing issues that could affect the interconnection costs of new generators and cause uncertainty; and potential permitting coordination between the Energy Commission and CPUC. The Siting Committee would like to know whether and how those potential problems have affected the siting experience of applicants in our process with regard to costs, timing and other factors. There may also be other interconnection problems experienced by parties in the Energy Commission’s siting process that have not been mentioned here. The Siting Committee also wants to know what those interconnection problems are and how they may have impacted applicants.

### CONGESTION RELATED ISSUES

Congestion problems could be a barrier to power plant siting in California. We recognize that these issues were addressed during the CAISO's Advanced Congestion Cost Mitigation (ACCM) proceedings in 1998 and 1999. We do not want to re-live those proceedings. We would, however, like developers to describe the nature and causes of congestion related impediments to power plant siting they have experienced. We are interested in where such impediments are located vis a vis market opportunities, what measures would be necessary to ameliorate those barriers, and where cost responsibility for transmission expansions or upgrades to mitigate those problems should reside? We would also like to know what collective efforts have been made by project developers to mitigate congestion problems constraining market access for new developers.